



REVIEW OF FLAT PANEL DISPLAY PROGRAMS AND DEFENSE APPLICATIONS

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SPIE - Cockpit Displays IV
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AGENDA



I. INTRODUCTION

II. REVIEW RECENT ACCOMPLISHMENTS ON SEVERAL
HDS PROGRAMS

III. WHERE THE HDS PROGRAM IS GOING

IV. CONCLUSIONS

HDS PROGRAM GOALS



OBJECTIVE:

Develop leading-edge display technology to meet diverse, but specific, DoD needs. The goals include increased power efficiency, reduced weight and improved ruggedness, while pushing the state-of-the-art in display performance. Demonstrate DARPA-funded technology in military applications.

WHAT DO DISPLAYS BRING TO DoD



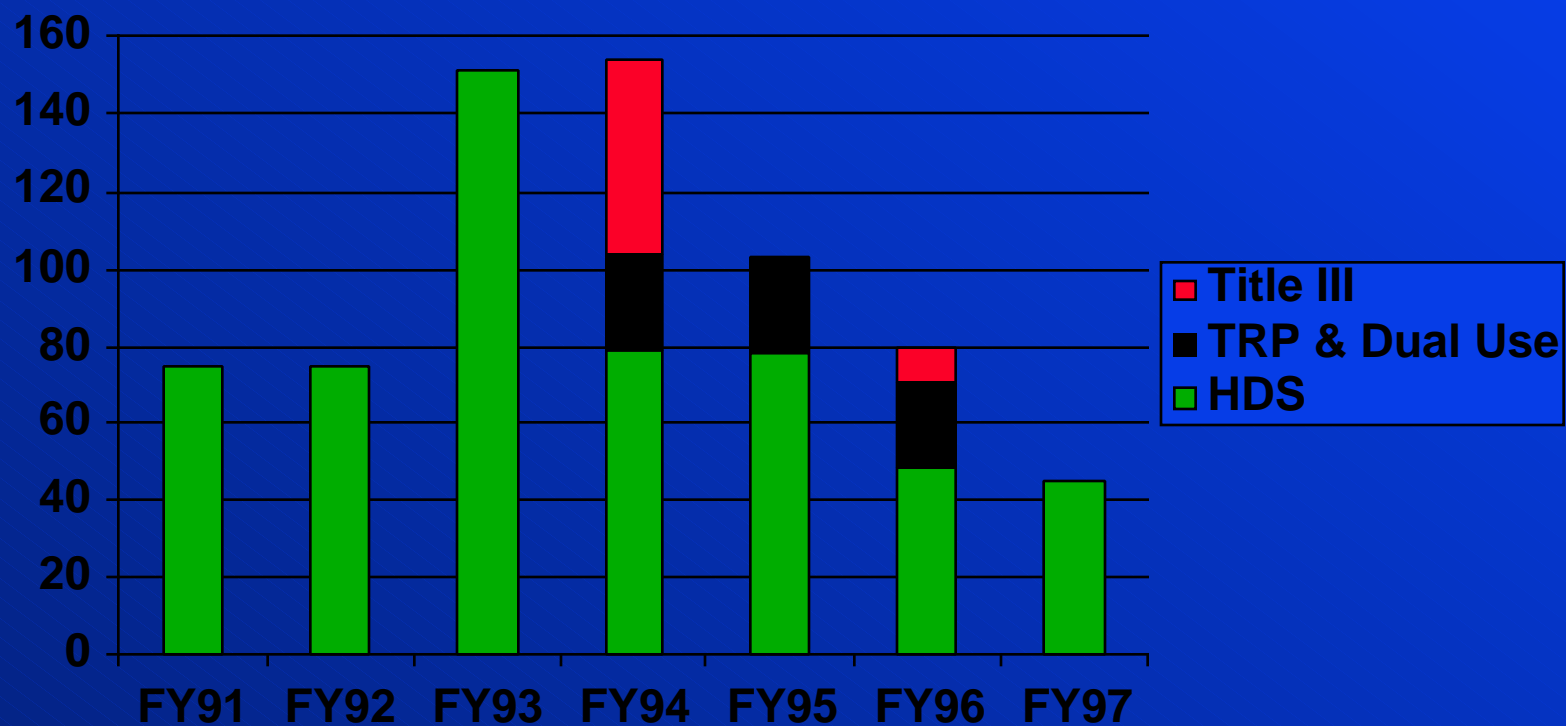
- **IMPROVED PERFORMANCE FOR THE WARFIGHTER**

- Displays often control information uptake impacting the speed and effectiveness of decision making
- Essential for the digital battlefield from command-and-control to the foot soldier

- **INCREASED RELIABILITY AND READINESS**

- Typical MTBF for CRT's or mechanical instruments is 300 hrs
- Major reduction in Lifecycle Costs

Display Funding History



DoD Display Programs



DARPA CORE TECHNOLOGY AND SYSTEMS PROGRAMS

PROGRAM	YEARS	PURPOSE
High Definition Systems (HDS)	89 - Pres.	Create new display technology
Head Mounted Display Systems (HMDS)	93 - 97	Demonstrate HMDs in field
United States Display Consortium (USDC)	93 - Pres.	Provide industry a voice
Advanced Information Component Manufacturing (AICM)	93	Access DoE labs expertise
Phosphor Technology Center of Excellence (PTCOE)	94 - Pres.	Establish phosphor research
Thin Film Transistor Teams (TFT Teams)	94 - Pres.	Team academia with industry

AMLCD MANUFACTURING TESTBEDS AND DOMESTIC CAPACITY FUNDED BY DARPA

PROGRAM	YEARS	PURPOSE
AMLCD Manufacturing Technology (AMLCDMT)	93 - 94	Manufacturing testbed (OIS)
High Density AMLCD Mfg Technology (HDAMLCD)	94 - 95	Testbed (Xerox/Standish/ATT)
Defense Production Act Title III for AMLCD (DPA Title III)	94 - Pres.	Increase domestic capacity

DoD Display Programs (cont.)



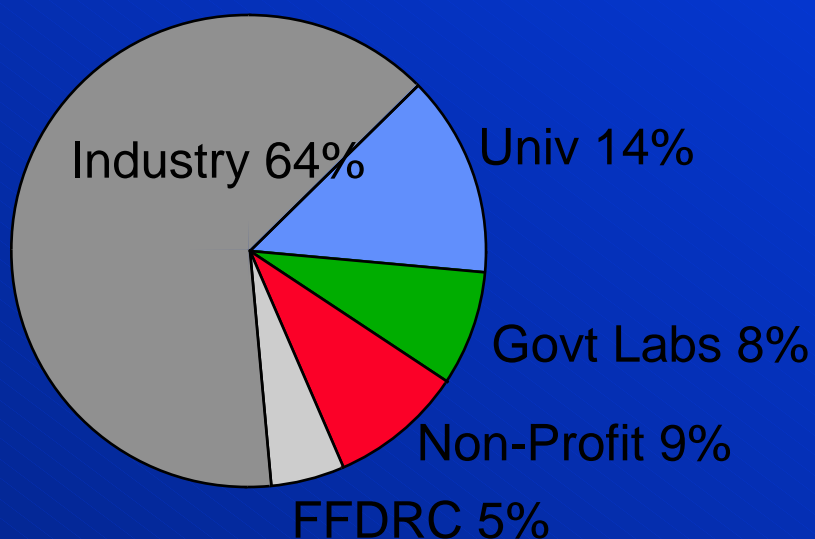
EFFORTS FUNDED BY DARPA TECHNOLOGY REINVESTMENT PROGRAM (TRP) DUAL USE TECHNOLOGY PROGRAM

PROGRAM	YEARS	PURPOSE
Active matrix electroluminescent, inorganic (AMEL)	94 - 97	Develop advanced EL (Planar-led)
Field Emission Display, High Then Low Volume (FED HLV)	94 - 97	Use US Intel. Prop. (Candescent-led)
Field Emission Display, Low Then High Volume (FED LHV)	94 - 97	French Intel. Prop. (Raytheon/Motorola)

EFFORT FUNDED BY DARPA HDS AND TACOM HTP FOR VERTICAL INTEGRATION AT U.S. COMPUTER MAKER

PROGRAM	YEARS	PURPOSE
Field Emission Display, Original Equipment Manufacturer (FED OEM)	97 - 98	Integrate FPD w/OEM (Micron)

DARPA OVERVIEW



FY96

BUDGET (\$ M)

	FY96	FY97	FY98
•Basic Research	76.5	90.7	76.0
•Applied Research	754.2	710.0	829.9
•Adv Tech Dev	1,358.4	1,298.7	1,256.6
•MGMT & Spt	80.1	41.0	43.9
TOTALS	2,269.2	2,140.4	2,206.4

ETO Mission and Thrusts

Engineered Microsystems to Perceive and Control the Physical World



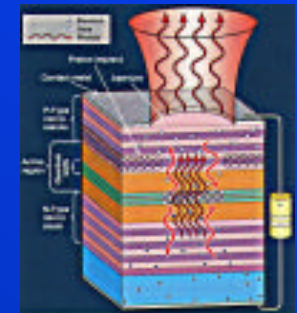
Sense and Action Amplifiers for the Warfighter

- portable and embedded information systems
- imagers and displays to extend human sensory capabilities
- expendable, densely-distributed networked sensors
- cooperative, multiple and adaptive robotics



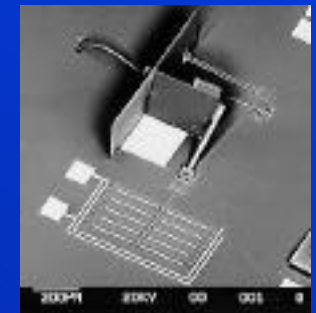
Battlespace Information Channels and Connectivity

- millimeter-wave and microwave components and subsystems
- integrated radio-frequency devices, systems and architectures
- platform-scale fiber and free-space optical networks



Large-Scale Integration of Multi-Technology Systems

- mechanical, optical, fluidic, and chemical VLSI
- mixed-technology packaging and interconnects
- electronic design tools for mixed energy domains



Exploratory Device and Fabrication Technologies

- tera-scale devices and integration
- molecular-scale pattern definition and transfer
- extreme-condition electronics and systems
- transduction and energy-coupling devices



Motivation for New Directions of the Office

Engineered Microsystems to Perceive and Control the Physical World



Electronics for computation has been enormously successful

- fixed, embedded and portable computing ability rapidly increasing ...
... but not because people want or need pervasive programming environments,
- previously dumb machines/structures/appliances/objects being invested with computing/processing capability for enhanced or new functionality,
- technologies that will pace continued advances in smart systems are not computing technologies but *technologies that invest systems with sense, communication and action abilities.*

DoD needs smart systems with enriched sense and action abilities

- to invest existing and future weapons systems with superior and overwhelming capabilities,
- that will amplify and project the military capability of available warfighters and platforms,
- for *enhanced situational awareness and control of the battlespace.*

HDS PROGRAM TODAY



- Innovative technology
- Manufacturing and Infrastructure
- Military significance
- Business plans
- Customer advocacy/buy-in
- Upcoming BAA
 - Miniature, small, and large area displays
 - Application demonstrations

HDS Program History



- The HDTV years
- The “lots of little innovative technology” years
- The manufacturing emphasis years
- The Dual-use years
- Today

Electroluminescent Display Applications



Display Technology	Program	Application	Service
• AMEL miniature display	Land Warrior	ground soldier BMD	US Army
• AMEL miniature display	HSTAMIDS	mine detection HMD	US Army
• AMEL miniature display	PNVG	fighter NVG/HUD	USAF
• AMEL miniature display	NV/HUD	Helo NVG/HUD	USAF
• AMEL miniature display	Comanche	Helo avionics HMD	US Army
• AMEL miniature display	HMTI	Thermal ImagerHMD	US Army
• AMEL miniature display	MARSS	Body-worn computer	US Army

